

SPACE EXPLORATION SYMPOSIUM (A3)
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RETURN TO VENUS OF THE JAPANESE VENUS CLIMATE ORBITER AKATSUKI

Abstract

Japanese Venus Climate Orbiter 'AKATSUKI' (PLANET-C) was proposed in 2001 with strong support by international Venus science community and approved as an ISAS mission soon after the proposal. AKATSUKI and ESA's Venus Express complement each other in Venus climate study. Various coordinated observations using the two spacecraft have been planned. Also participating scientists from US have been selected. The mission life we expected was more than 2 Earth years in Venus orbit.

AKATSUKI was successfully launched at 06:58:22JST on May 21, by H-IIA F17. After the separation from H-IIA, the telemetry from AKATSUKI was normally detected by DSN Goldstone station (10:00JST) and the solar cell paddles' expansion was confirmed. AKATSUKI was put into the 3-axis stabilized mode in the initial operation from Uchinoura station and the critical operation was finished at 20:00JST on the same day.

The malfunction, which happened during the Venus Orbit Insertion (VOI) on 7 Dec, 2010 is as follows. We set all commands on Dec. 5. Attitude control for Venus orbit insertion (VOI) was automatically done on Dec. 6. Orbital maneuver engine (OME) was fired 08:49 JST on Dec. 7. 1min. after firing the spacecraft went into the occultation region and we had no telemetry, but we expected to continuous firing for 12min. Recording on the spacecraft told us later that, unfortunately the firing continued just 152sec. and stopped. The reason of the malfunction of the OME was the blocking of check valve of the gas pressure line to push the fuel to the engine. We failed to make the spacecraft the Venus orbiter, and it is rotating the sun with the orbital period of 203 days.

Most of the fuel still remains, but the OME was found to be broken. We decided to use only RCS for orbit maneuver and 3 minor maneuvers in November 2012 were successfully done so that AKATSUKI will meet Venus in 2015. We are considering several scenarios only using RCS for VOI. It will be hard to keep the equatorial orbit through the VOI in 2015, but if we wait another year and will do the VOI in 2016 there is a chance to have an equatorial orbit. Preferable orbit and the life time of the spacecraft is the trade off.